

**Los Alamos National Laboratory  
Request for Approval for Continued Generation of Waste With No Disposal Path  
Off-Site Source Recovery Project  
US Radiological Threat Reduction**

**September 6, 2004**

**1. Description of process generating waste, location, program sponsor, and M&O contractor contact.**

**a. PROGRAM FUNDED BY:**

**DOE-EM-22: DOE-AL/WMD B&R EY0801100  
NNSA-NA-21: NNSA-NA211 B&R NN4001012  
NNSA-NA-21: NNSA-NA211 B&R NN8001000**

**b. PROGRAM SPONSOR/PROJECT MANAGER:**

**NNSA-NA211 Program Manager, Robert Campbell (202) 586-7544  
NNSA-NA211 Program Manager, Joel Grimm (202) 586-9681  
NNSA-LASO Patrick Moss, NN Program Liaison (505) 665-9233**

**c. LANL CONTACT:**

**Lee Leonard, N-N-GTR, Lead Project Leader (505) 665-8292  
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**d. DESCRIPTION – PROJECT GENERATING WASTE:**

The Off-site Source Recovery (OSR) Project has the responsibility to identify, recover, and store excess and unwanted radiological sources on behalf of NNSA/DOE in cooperation with the U.S. Nuclear Regulatory Commission. This mission has required the OSRP to generate waste with no disposal path (NDP) for storage at LANL since 1999. In 2004, following the transfer of management of LANL's OSRP to NNSA NA211 as the US Radiological Threat Reduction Program, the previous mission of the Project was expanded via memorandum from the Deputy Administrator, Defense Nuclear Non-Proliferation to the Manager, Los Alamos Site Operations March 2, 2004. As a part of NNSA's Global Radiological Threat Reduction initiative in FY-04 and into the foreseeable future, the Project scope has been expanded from the original mission defined in PL99-240 and DOE's response to Congress. Specifically, the scope was expanded to provide consistency across the activities performed by NA20 to include:

- All concentrations of the sources in the original scope (PL99-240) commonly found in sealed sources; for GTCC isotopes, national security will be the primary driving factor, rather than the lower Class-C limit.

- The additional isotopes of Californium-252, Cobalt-60, Iridium-192 and Radium-226, all of which are commonly found in sealed sources.

OSR Project operations are conducted within the Characterization Group of the Risk Reduction and Environmental Stewardship Division at LANL. The Project has successfully managed actinide bearing sealed sources since 1999 under the direction of DOE-EM. Now under NNSA, the program is funded through the N Division Non-Proliferation Global Threat Reduction Program office with the line organization remaining within RRES-CH. Operational management of actinide sources, although now inclusive of sources of greater activity ranges, will remain the same from previous no disposal path waste submittals.

Actinide sources are packaged off-site and shipped to LANL in compliance with Department of Transportation regulations (49CFR). Shipping containers are received at the LANL Supply Chain Management (SUP) receiving warehouse SM-30. At SM-30, they are subject to standard receiving requirements that include activities such as inspection for damage, radiological survey and, in some cases, verification measurements for special nuclear materials. Shipping packages containing accountable actinide materials on which safeguards may be directly terminated (see Termination of Safeguards on Excess Sealed Sources containing Am-241 and Pu-238) with no recycle or reuse potential and with no further handling needs are declared as waste and re-manifested for placement in storage at Area G, TA-54. The SUP organization transports the containers to TA-54 for storage. If materials in a container require additional handling or are to be used by the OSR Project for specific purposes such as dose rate studies, use as calibration sources, or other needs, the containers are trans-shipped to Wing 9, CMR for activities as prescribed. Shipping packages containing accountable Special Nuclear Material (SNM) which must be continually held under safeguards require preparation and submission of documentation to satisfy Material Control and Accountability requirements. Receipt of accountable packages of SNM (Pu-239-bearing sources) require continued safeguards and are placed in an authorized Materials Balance Area (MBA) until they are designated as waste immediately prior to shipment off the LANL site for disposal at WIPP.

Of the actinide materials managed by the OSR Project, only radiological sources which do not have a DOE determination that they were generated as part of “atomic energy defense activities” are without a disposal path.

OSR Project personnel are located at the RRES-CH office at LANL TA-46, Buildings 231/232/234. Program management is provided through the N Division Non-Proliferation, Global Threat Reduction Program office located in the Nonproliferation International Security Center (NISC) at TA-3. On-site storage of sources with no disposal path is provided in CMR and TA-54, Area G. Off-site storage of actinide sources, prior to shipment to LANL is provided by LANL subcontractors at NSSI, Houston, TX; CPN, Martinez, CA; and Troxler Electronic Laboratories at Research Triangle Park, NC. Packaging of sources at off-site contractors locations for shipment to LANL is an ongoing activity. LANL on-site operations are initiated with receipt of consolidated source shipments at the SUP receiving facility (TA-3, SM-30). If shipments

are to be immediately transferred to TA-54, Area G for storage as TRU or LLW waste, the Material Control & Accountability Office (S-4) performs a transfer check at SUP and prepares the discard paperwork. The containers are then transferred directly to TA-54.

In FY-04 the OSR Project was authorized to accept non-actinide sources at LANL in the form of large Sr-90 Radio-Isotope Thermal-Electric Generators (RTGs). The acceptance method was similar to the actinide-bearing sources.

Utilization of LANL facilities and organizations is monitored closely to ensure compliance with safety basis or other limitations on the quantity of materials used or stored within a facility. This monitoring is conducted jointly by the OSR Project and the LANL organization/facility involved. Concerns associated with the limited Material at Risk (MAR) capacity remaining in TA-54, Area G have been resolved, with allocation of sufficient inventory to the OSR Project to allow planned operations in 2004 and 2005. Current inventories of materials stored in LANL facilities are shown in Table 1.

**Table 1. Currently Stored Material with No Disposal Path**

<b>LANL Facility</b>	<b>Number of 55-gallon drums</b>	<b>Total Number of sealed sources</b>	<b>Types of Sources Classified as Waste NDP</b>
Area G, TA-54 – above ground	<b>673</b>	<b>8527</b>	Pu-238 and Am-241
Area G, TA-54 – Retrievable shaft	<b>0</b>	<b>4</b>	Sr-90 RTGs
Wing 9, CMR	<b>1</b>	<b>22</b>	Am-241, Pu-238

The OSR Project has initiated efforts to develop management capabilities at LANL for the non-actinide nuclides included in the NA-211 scope expansion. The Project has successfully completed the recovery of four high-activity Sr-90 RTGs and their placement into retrievable shaft storage at Area G, TA-54. In addition, the OSR Project completed the recovery and disposal of a number of non-actinide sources from a commercial organization at the specific request of the NRC in 2004. This effort was completed through the utilization of a commercial contractor and resulted in the disposal of the sources at a commercial disposal facility. As defined in management plans submitted for approval, the OSR Project intends to utilize commercial organizations and facilities for the management of non-actinide sources as much as possible. LANL capabilities will be developed to ensure the ability to respond to NNSA requests for emergency recoveries and will be utilized only if commercial capabilities are not available.

**2. Waste that cannot be disposed of and the projected volume (annual volume and volume over the life of the project or activity) of waste that will be generated by the process.**

**Annual Volume Projections:** The total volume of NDP waste in the form of actinide sources over the life of the Project is expected to be approximately 180 cubic meters, of which approximately 135 cubic meters have been placed in storage through FY2004. Projected annual volumes for the duration of the Project are shown in the table below.

FY	VOLUME in m <sup>3</sup>
2005	40
2006	12
2007	8
2008	5
2009	2
2010	1

*Anticipated volume Over the Life of the Project*

Source Type	Typical Activity (Ci/ea)	Number of Sources	Anticipated Packaging (# per Drum)	# of Drums*	Total Volume * (m3)
Am-241 Calibration Sources	.005	3960	330	12	2.4
Am-241 Medical Sources	.1	TBD	TBD	TBD	TBD
Pu-238 Medical Sources	8	1440	6	240	48
Am-241Be Well Logging Sources	3	3870	10	387	77.4
Pu238Be Well Logging Sources	10	204	3	68	13.6
Am-241Be General Neutron Sources	1	1800	30	60	12
Am-241Be/Cs-137 Portable Gauge Sources	.045/.01	1200	100	12	2.4
Am-241Be Portable Gauge Sources	.045	400	200	2	.4
Am-241 Fixed Gauges	.124	2040	85	24	4.8
Am-241 XRF Sources	.18	2112	88	24	4.8
<b>TOTALS</b>	N/A	17346	N/A	869	173.8

\*Final package volumes and numbers of drums will vary based on actual packaging efficiencies.

TBD = To Be Determined

The OSR Project has initiated efforts to define the inventory of non-actinide sources requiring management. More information will be provided when available, as requested. The only non-actinide sources currently approved for long-term storage at LANL, based on information available to date, are Sr-90 RTGs that existed outside the institutional

control of DOE/DOD facilities. The total Sr-90 activity at Area G, with the recovery of 2 additional units currently approved for acceptance will be approximately 106,000 Curies. In late May 2004, an RTG containing 13,500 Ci. of Sr-90 was disposed in its unit shipping package which was used as the packaged waste form as LLW at NTS. In mid September 2004, 2 RTGs containing 60,510 Ci. were disposed as LLW at Hanford. Based on that precedent, the volume the waste will occupy is, as a maximum, equal to the volume of the units. This volume is estimated at 2.8 cubic meters.

Since notification of the expanded list of nuclides eligible for OSR Project management, calls for source owners to register sources with the project have resulted in the registration of several hundred additional sources. A summary of excess and unwanted sources registered as of 9/13/04 is provided in the table below. We can expect that recovery of these sources will be a high priority for the NRC and NA-211, especially the high-activity gamma sources contained in irradiation devices. There are no current plans to recover and transport these sources to LANL for storage. However, the project has been directed by NA-211 to determine the current compliance envelope at LANL should national security concerns require expedited recovery to a secure NNSA site.

**Additional Sources Registered with the OSR Project – Newly Eligible Materials**

<b>Nuclide</b>	<b>Number of Sources</b>	<b>Curie Content</b>
Co-60	260	87,385
Cs-137	132	14,026
Sr-90	49	3,824,560
Ra-226	14	2.7
Cm-244	76	3.2
Cf-252	24	0.1

**3. Identification of NEPA documentation for this operation and the generation and disposition of the waste.**

NEPA approvals for the Project include:

Supplement Analysis, Final Site-Wide Environmental Impact Statement (EIS) for Continued Operation of Los Alamos National Laboratory, Determination, dated 10/17/00, signed by David A. Gurule, Area Manager, Los Alamos Area Office.

Recovery and Storage of Strontium-90 (Sr-90) Fueled Radioisotope Thermal Electric Generators at Los Alamos National Laboratory, Supplement Analysis Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, signed by Ralph Erickson, Los Alamos Site Office.

In addition, the OSR Project submitted proposed management plans and analysis of limitations to the LANL Ecology office for inclusion in the ongoing revision to the Site Wide Environmental Impact Statement.

#### **4. Identification of documents that make up the authorization basis for the operation.**

The OSR Project operations within a particular LANL facility are evaluated and included, as appropriate, in the authorization basis documents for that facility prior to conduct of operations in the facility. This process has been successfully completed for OSR Project operations in Wing 9, CMR and Area G, TA-54.

NMT-11 conducted a review of ongoing and proposed activities within Wing 9 against the Authorization Basis documents listed below and with work-specific Hazard Control Plans, IWDs, and work scheduling requirements for work in the CMR, Wing-9.

- “CMR Basis for Interim Operations”, LA-CP-98-142, Rev. 1
- “Management Evaluation Report for the Chemistry and Metallurgy Research (CMR) Facility Basis for Interim Operations (BIO)”, transmitted by letter (LAM:3DG-030) from Daniel E. Glenn (DOE) to R. Bruce Mathews (ALNL), Aug 31, 1998
- “Control and Execution of CMR Safety System LCOs and Surveillances”, NMT13-TSR-002 (Interim Technical Safety Requirements)
- “Approval of CMR Facility Interim Technical Safety Requirements (ITSRs)”, transmitted by letter (LAM:3CS-020) from David A. Gurule (DOE) to R. Bruce Matthews (LANL), December 11, 1998

Operations within Area G, TA-54 are addressed in TA-54 Area G Documented Safety Analysis, ABD-WFM-001, dated April 9, 2003. This document was approved in memorandum “Technical Area 54, Area G Safety Evaluation Report (SABT:NS:112703), from Chris Steele, Los Alamos Site Office to Tony Stanford (LANL), November 28, 2003.

#### **5. Explanation of the waste characteristics and issues that prevent treatment/ disposal of the waste.**

The Low-Level Radioactive Waste Policy Amendments Act (PL99-240) of 1985 assigned DOE the responsibility for disposal of low level radioactive wastes (LLW) exceeding Class-C limits as established by 10CFR61.55 which result from activities licensed by U.S. NRC and Agreement States. The Act also directed that the disposal facility be licensed by the U.S.NRC. A large fraction of the sources recovered by the OSR Project “result from these licensed activities.” Until such time as DOE identifies a disposal location consistent with these statutory requirements, much of the material recovered by the OSR Project will remain without a defined disposal pathway. The OSR Project currently manages two distinct waste streams containing actinides within this

definition that contribute to wastes with no disposal path and one non-actinide waste stream.

- a. Actinide bearing sealed sources, which are excess and unwanted and are owned by DOE, resulting from non-defense activities and legacy agreements with other agencies. This stream is currently estimated at approximately 10% of the total volume.
- b. Actinide bearing sealed sources, which are excess and unwanted resulting from licensed industrial and research activities in the public and private sectors for which DOE is ultimately responsible under PL99-240. This stream is currently estimated at approximately 90% of the total volume.

These two waste streams are restricted from disposal at the WIPP facility because to date these wastes have not been reviewed and determined to result from “atomic energy defense activities” as defined in the Radioactive Waste Policy Act, of 1982 and “The Carlsbad Area Office Interim Guidance of Ensuring that Waste Qualifies for Disposal at the Waste Isolation Pilot Plant”, February 13, 1997. Currently there is no defined disposal path for these waste streams.

c. Non-actinide nuclides in the form of large Sr-90 RTGs are currently stored at TA-54 Area-G. Since these units result from licensed activities there is no currently approved disposal path. However, DOE-owned Sr-90 RTGs have been disposed at NTS as LLW. Therefore the precedent exists for disposal within a defined performance assessment at a facility does exist. Opportunities for similar disposal of such units currently stored at LANL are still under investigation.

#### **6. Description of activities and inquiries to determine if a treatment/disposal path is available, waste minimization studies, and any national efforts to provide treatment and disposal option.**

With the transfer of responsibilities for the OSR Project from DOE-EM to NNSA, EM retained the responsibility for disposal development for all wastes designated as a DOE responsibility under PL99-240 and for DOE-owned materials resulting from non-defense activities. In the transfer documents, the original requirement for development of disposal capabilities to be initiated in FY05 and with a disposal pathway to be available in FY07, was extended. The FY05 DOE-EM budget request document shows creation of an Office of Future Liabilities with an expressed mission to develop disposal capabilities for Greater Than Class C sealed sources. Thus the OSR Project and NA-211 continue to defer to DOE EM pending specific guidance on disposal through FY07.

Other activities, either completed, or underway to accelerate the decision making process on NDP waste are discussed below.

- In FY03, DOE GC-1 determined that, due to the source of isotopic materials used in the construction of Pu-239-bearing sealed sources and the continuous ownership of the contained Pu-239 by DOE, all Pu-239 sources met the definition

of resulting from “atomic energy defense activities.” This determination made this particular class of sources eligible for disposal at the WIPP, and allowed removal of all Pu-239 sources from the “no disposal pathway” category. Efforts are underway by the OSR Project and the NNSA program sponsor to analyze the origins and distribution histories and use patterns associated with Am-241 and Pu-239 materials that might support a determination similar to that for the Pu-239 sources. Since Pu-239-bearing sources are also designated to be Attractiveness Level-C SNM it was necessary to acquire permission from NNSA/DOE-SO to terminate safeguards on these sources prior to disposal at the WIPP facility. This was acquired March 24, 2003. Since receiving these approvals to dispose, one shipment containing two drums of Pu-239 sealed sources was transferred to the WIPP on May 6, 2003.

- In FY04, the OSR Project initiated negotiations and communications with the Nevada Test Site (NTS) to investigate disposal opportunities at the NTS facility for non-actinide DOE-owned sources that may be recovered by the OSR Project. As discussed above, precedents to this activity have been completed with the disposal at NTS of a DOE-owned Sr-90 RTG from Sandia National Laboratory. Currently, NTS personnel are working with Oak Ridge on the disposal of similar DOE owned RTGs.
- In September of 2004, the OSR Project was notified by DOE CBFO that Revision 20 to the TRUPACT II SAR had been approved by the NRC. This revision allows for a more efficient packaging of sources in the TRUPACTII, permitting higher activity payloads of WIPP eligible sealed sources to be shipped. This also has the effect of reduced waste volumes for sources to be packaged and disposed at WIPP in the future.
- Recycle and reuse potential for sources continues to be evaluated and used on a case by case basis for both actinide and non-actinide sources. Isolated sources containing Pu-238 have been recycled successfully while evaluations of the potential for other Pu-238 recycle are underway. In addition, non-actinide sources containing Co-60 and Cs-137 are recycled as the opportunity arises. The non-actinide recycle effort is still in development yet is expected to provide considerable opportunities for reuse – thus reducing the need for production of additional sources which would require management at some later date. However, considering the national security implications radiological sources recovered by the OSR Project it is doubtful that recycle of these sources back into the environment will be a desired disposition path in the future.

#### **7. Estimate of Life-Cycle Costs (LCC) for storage and maintenance of the waste, and estimate of ultimate disposal costs if possible.**

The total life cycle costs for storage and maintenance of 700-900 drums of actinide-bearing sealed sources at TA-54, Area G was originally estimated at \$1.2 million from FY2000-2010. An additional \$1 million was budgeted for infrastructure improvements at Area G, which may be required to support this inventory of material, resulting in a total



LCC of \$2.2 million. In addition, it was assumed that should disposal not be available in FY2007, an additional \$350k per year would be required each year from FY2007 through 2010 and for each additional year until disposal is available.

Uncertainties associated with development of disposal facilities preclude estimation of actual disposal costs.